

We claim:

1 1. A fluid channeling device for a percussive drill, the drill
2 including a casing having an interior space, a drive chamber and
3 a valve chamber each being defined within the casing interior
4 space, a piston movably disposed within the casing and having an
5 upper end disposeable within the drive chamber and a
6 longitudinal through-bore, a valve configured to control flow
7 into the drive chamber and having a surface bounding a section
8 of the valve chamber, the channeling device comprising:
9 a first member disposed at least partially within the drive
10 chamber so as to extend into the piston bore when the piston
11 upper end is located within the drive chamber, the first member
12 having an outer surface, an interior space and at least one port
13 extending between the outer surface and the interior space and
14 fluidly connectable with the drive chamber; and
15 a second member disposed at least partially within the
16 first member interior space and having a passage fluidly
17 connected with the valve chamber and fluidly connectable with
18 the port so as to establish fluid communication between the
19 drive chamber and the valve chamber.

1 2. The fluid channeling device as recited in claim 1 wherein
2 the valve is displaceable between an open position and a closed
3 position and when the port and the passage fluidly connect the
4 drive chamber with the valve chamber, fluid flow into the valve
5 chamber displaces the valve from the open position to the closed
6 position.

1 3. The fluid channeling device as recited in claim 2 wherein
2 the casing further has a longitudinal centerline and the piston
3 is displaceable along the centerline and with respect to the

4 fluid channeling device such that the piston substantially
5 prevents fluid communication between the drive chamber and the
6 port when the port is disposed within the piston bore and the
7 port is fluidly connected with the drive chamber when the port
8 is disposed externally of the piston bore.

1 4. The fluid channeling device as recited in claim 2 wherein:
2 the casing has a longitudinal centerline and the piston is
3 displaceable generally along the centerline between a most
4 proximal position with respect to the valve chamber, at which
5 the first member is disposed at least partially within the
6 piston bore, and a most distal position with respect to the
7 valve chamber, at which the first member is spaced apart from
8 the piston along the centerline;

9 the port is a first port and the first member further has a
10 central axis and a second port spaced from the first port
11 generally along the axis, one of the first and second members
12 being angularly displaceable with respect to the other one of
13 the first and second members such that the first port is fluidly
14 connected with the passage in a first angular position and the
15 second port is fluidly connected with the passage in a second
16 angular position; and

17 when the first port is fluidly connected with the passage,
18 the valve moves to the closed position after the piston
19 displaces at least a first distance from the proximal position
20 and alternatively when the second port is fluidly connected with
21 the passage, the valve moves to the closed position after the
22 piston displaces at least a second distance from the proximal
23 position, the second distance being greater than the first
24 distance.

1 5. The fluid channeling device as recited in claim 1 further
2 comprising a central axis extending longitudinally through each
3 one of the first and second members and wherein at least one of
4 the first and second members is angularly displaceable about the
5 axis with respect to the other one of the first and second
6 members so as to adjust the position of the port with respect to
7 the passage.

1 6. The fluid channeling device as recited in claim 5 wherein:
2 the second member has an outer surface and the passage is
3 formed as an elongated groove extending generally radially into
4 the second member from the outer surface, the groove being
5 spaced from and extending generally parallel with respect to the
6 central axis; and
7 the first member has a plurality of ports extending between
8 the interior space and the first member outer surface, each one
9 of the ports being spaced axially and radially about the axis
10 from each of the other ports such that each port is fluidly
11 connectable with the passage at a separate one of a plurality of
12 angular positions of the first member with respect to the second
13 member.

1 7. The fluid channeling device as recited in claim 6 wherein
2 the plurality of ports are spaced apart along a generally
3 helical line extending at least partially circumferentially
4 about and axially along the central axis.

1 8. The fluid channeling device as recited in claim 5 wherein
2 the first member has at least a first port and a second port,
3 the first port being spaced a first distance from the valve
4 chamber and the second port being spaced a second distance from

5 the valve chamber, the second distance being greater than the
6 first distance.

1 9. The fluid channeling device as recited in claim 1 wherein
2 the first member includes a generally tubular body and the
3 second member includes a generally cylindrical body portion
4 sized to fit within the tubular body.

1 10. The fluid channeling device as recited in claim 9 wherein
2 the tubular body has an inner circumferential surface and the
3 second member cylindrical body portion has an outer
4 circumferential surface, the inner and outer circumferential
5 surfaces each being configured to frictionally engage with the
6 other surface so as to retain the cylindrical body portion
7 disposed within the tubular body.

1 11. The fluid channeling device as recited in claim 1 further
2 comprising a central axis extending longitudinally through each
3 of the first and second members and wherein the first member
4 further includes an outlet port extending between the outer
5 surface and the interior space and spaced apart from the port
6 along the central axis, the outlet port being fluidly connected
7 with the valve chamber and with the second member passage.

1 12. A fluid channeling device for a percussive drill, the drill
2 including a casing having an interior space, a drive chamber and
3 a valve chamber each being defined within the casing interior
4 space, a piston movably disposed within the casing and having an
5 upper end disposable within the drive chamber and a longitudinal
6 through-bore, a valve configured to control flow into the drive
7 chamber and having a surface bounding a section of the valve
8 chamber, the channeling device comprising:

9 a generally tubular body disposed at least partially within
10 the drive chamber so as to extend into the piston bore when the
11 piston upper end is located within the drive chamber, the first
12 member having an outer and inner circumferential surfaces and a
13 plurality of ports, each port extending between two surfaces and
14 fluidly connectable with the drive chamber; and

15 a generally cylindrical body disposed at least partially
16 within the tubular body and having a passage fluidly connected
17 with the valve chamber, at least one of the tubular body and the
18 cylindrical body being angularly displaceable with respect to
19 the other one of the tubular body and the cylindrical body such
20 that each one of the ports is fluidly connectable with the
21 passage at a separate angular position of the tubular body with
22 respect to the cylindrical body so as to establish fluid
23 communication between the drive chamber and the valve chamber.

1 13. The fluid channeling device as recited in claim 12 wherein
2 the valve is displaceable between an open position and a closed
3 position and when the port and the passage fluidly connect the
4 drive chamber with the valve chamber, fluid flow into the valve
5 chamber displaces the valve from the open position to the closed
6 position.

1 14. The fluid channeling device as recited in claim 13 wherein:
2 the casing has a centerline and the piston is displaceable
3 generally along the centerline between a most proximal position
4 with respect to the valve chamber, at which the tubular body is
5 disposed at least partially within the piston bore, and a most
6 distal position with respect to the valve chamber, at which the
7 tubular body is spaced apart from the piston along the
8 centerline;

the fluid channeling device further comprises a central axis extending longitudinally through each one of the tubular body and the cylindrical body and generally colinearly with respect to the casing centerline, each one of the ports being spaced axially and radially about the axis from each of the other ports; and

when one of the ports is fluidly connected with the passage, the valve moves to the closed position after the piston displaces a first distance from the proximal position and alternatively when another one of the ports is fluidly connected with the passage, the valve moves to the closed position after the piston displaces a second distance from the proximal position, the second distance being greater than the first distance.

15. A drill comprising:

a casing having an interior space, a drive chamber and a valve chamber each being defined within the casing interior space;

a piston movably disposed within the casing and having an upper end disposeable within the drive chamber and a longitudinal through-bore;

a valve configured to control flow into the drive chamber and having a surface bounding a section of the valve chamber;

a first member disposed at least partially within the drive chamber so as to extend into the piston bore when the piston upper end is located within the drive chamber, the first member having an outer surface, an interior space and at least one port extending between the outer surface and the interior space and fluidly connectable with the drive chamber; and

a second member disposed at least partially within the first member interior space and having a passage fluidly

18 connected with the valve chamber and fluidly connectable with
19 the port so as to establish fluid communication between the
20 drive chamber and the valve chamber.

1 16. The drill as recited in claim 15 wherein the valve is
2 displaceable between an open position and a closed position and
3 when the port and the passage fluidly connect the drive chamber
4 with the valve chamber, fluid flow into the valve chamber
5 displaces the valve from the open position to the closed
6 position.

1 17. The drill as recited in claim 15 wherein:

2 the casing has a longitudinal centerline and the piston is
3 displaceable generally along the centerline between a most
4 proximal position with respect to the valve chamber, at which
5 the first member is disposed at least partially within the
6 piston bore, and a most distal position with respect to the
7 valve chamber, at which the first member is spaced apart from
8 the piston along the centerline;

9 the port is a first port and the first member further has a
10 central axis and a second port spaced from the first port
11 generally along the axis, one of the first and second members
12 being angularly displaceable with respect to the other one of
13 the first and second members such that the first port is fluidly
14 connected with the passage in a first angular position and the
15 second port is fluidly connected with the passage in a second
16 angular position; and

17 when the first port is fluidly connected with the passage,
18 the valve moves to the closed position after the piston
19 displaces at least a first distance from the proximal position
20 and alternatively when the second port is fluidly connected with
21 the passage, the valve moves to the closed position after the

22 piston displaces at least a second distance from the proximal
23 position, the second distance being greater than the first
24 distance.

1 18. The drill as recited in claim 15 further comprising a
2 central axis extending longitudinally through each one of the
3 first and second members and wherein at least one of the first
4 and second members is angularly displaceable about the axis with
5 respect to the other one of the first and second members so as
6 to adjust the position of the port with respect to the passage.

1 19. The drill as recited in claim 15 wherein:

2 the second member has an outer surface and the passage is
3 formed as an elongated groove extending generally radially into
4 the second member from the outer surface, the groove being
5 spaced from and extending generally parallel with respect to the
6 central axis; and

7 the first member has a plurality of ports extending between
8 the interior space and the first member outer surface, each one
9 of the ports being spaced axially and radially about the axis
10 from each of the other ports such that each port is fluidly
11 connectable with the passage at a separate one of a plurality of
12 angular positions of the first member with respect to the second
13 member.

1 20. The drill as recited in claim 15 wherein:

2 the first member includes a generally tubular body having
3 an inner circumferential surface; and

4 the second member includes a generally cylindrical body
5 portion sized to fit within the tubular body and having an outer
6 circumferential surface, the inner and outer circumferential
7 surfaces each being configured to frictionally engage with the

- 8 other surface so as to retain the cylindrical body portion
- 9 disposed within the tubular body.